

# **St. Maries River Monitoring Program 2002-2003**

**A Water Quality Sampling Project for the St. Maries River and 303 (d) listed tributaries.**

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**Developed for:** Benewah Soil and Water Conservation District (BSWCD)  
Idaho Soil Conservation Commission (SCC)  
Idaho State Department of Agriculture (ISDA)

**Prepared by:** Cary Myler, Idaho Association of Soil Conservation Districts

**Approved by:** \_\_\_\_\_  
Benewah Soil and Water Conservation District Chairperson

**Approved by:** \_\_\_\_\_  
Idaho Soil Conservation Commission Representative

**Approved by:** \_\_\_\_\_  
Idaho State Department of Agriculture Representative

## **Introduction:**

The St. Maries River and 17 tributaries have been identified under the Clean Water Act section 303(d) list of water quality impaired streams. The St. Maries watershed drains approximately 307,649 acres. Tributaries flow through steep V-shaped valleys that turn into low gradient meandering courses as they reach the valley floor. Forestry dominates in upland and agriculture occurs along lower reaches of tributaries and valley bottoms. The U. S. Geological Survey (USGS) has operated a gauging station on the St. Maries River near Santa from 1965 to present. This monitoring program is designed to collect samples at agriculturally prioritized segments every two weeks for a one-year period. The data will be used by BSWCD, ISDA, and the SCC to quantitatively set load allocations for best management practice (BMP) implementation as well as provide a baseline to measure future BMP effectiveness.

## **Monitoring Program:**

This water quality monitoring program is intended to provide baseline data on the St. Maries River and its 303 (d)-listed tributaries. This monitoring plan was originally designed in coordination with the Benewah Soil and Water Conservation District (BSWCD), and Soil Conservation Commission (SCC) and the Idaho Association of Soil Conservation Districts (IASCD) to fill data gaps that exist in the watershed. Monitoring near the agriculture-forest boundary and near the mouth will enable managers to determine where loads are entering the stream to allow prioritization for the implementation of BMPs.

Specific parameters to be tested are total phosphorus (TP), bacteria (*Escherichia coli* and total coliform), nitrate+nitrite ( $\text{NO}_3+\text{NO}_2\text{-N}$ ), turbidity, total suspended solids (TSS), instantaneous temperature, continuous temperature, dissolved oxygen (DO), and percent (%) saturation. With the exception of continuous temperature monitoring, parameters will be monitored on an instantaneous basis with sampling occurring every two weeks. Funding will determine the duration of monitoring, but at least a full year would be recommended.

The University of Idaho Analytical Science Laboratory (ASL) will conduct all analytical parameter testing. Bacteria analysis will be performed by the State of Idaho Health and Welfare Laboratory in Coeur d' Alene. All other measurements will be performed by IASCD, or other personnel under supervision or training. Continuous temperature dataloggers will be installed at representative sites May 2003 and retrieved late October 2003.

This project is a cooperative effort between IASCD, ISDA, and SCC. ISDA and IASCD will provide the personnel, sampling equipment, and technical expertise. IASCD personnel will conduct the monitoring, perform data entry, and provide a summary report after the data has been gathered.

## **Program Objectives:**

IASCD will cooperate with ISDA, BSWCD and local landowners in an attempt to complete the following goals:

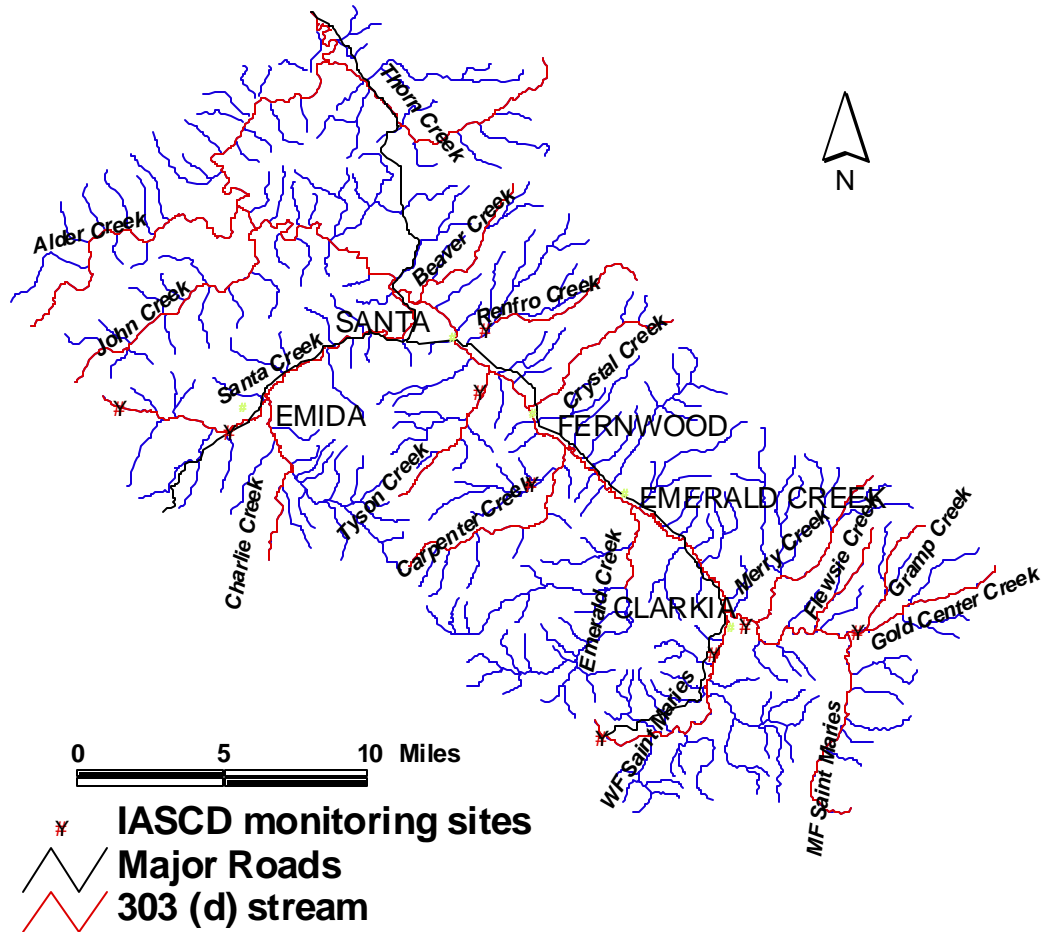
1. Evaluate the water quality and discharge rates of the St Maries River and impacted tributaries in order to provide a baseline for BMP implementation as well as for future effectiveness monitoring.
2. Attempt to determine which areas contribute to water quality exceedances or degradation.
3. Prioritize loading areas that may require BMP implementation or other possible management strategies.
4. Make data available to the public.

## **Site Description:**

Little or no agriculture was observed at Gold Center, Gramp, Flewise, Merry, Crystal, and Beaver Creeks. These streams were characterized by forestry activities. Emerald and Carpenter Creeks are impacted by agriculture, but extensive mining operations in downstream reaches, which were observed to contribute sediment to the streambed should be prioritized as mining impacted streams. The mining companies have collected baseline data and will continue to monitor these streams (Osburn, 2002 personal communication). This monitoring program will focus on priority streams St. Maries River (from Clarkia to town of St. Maries, West and Middle Forks of St Maries, Santa Creek, Renfro, and Tyson Creek. All IASCD monitoring stations are shown in Figure 1.

SM-1	MF St. Maries River (upstream of agricultural influence).
SM-2	MF St. Maries River (near confluence with WF).
SM-3	WF St. Maries River (near confluence with MF).
SM-4	WF St. Maries River (near mouth).
SM-5	Tyson Creek near mouth
SM-6	Renfro Creek near mouth.
SM-7	Little Carpenter Creek (near mouth).
SM-8	Santa Creek upstream of agricultural influence.
SM-9	Santa Creek below agriculture

# St Maries Watershed



## Sampling Methods

### Water Quality

At each monitoring station a DH81 (depth integrated sampler) will be used to collect a width and depth integrated sample, which will be composited into a 2.5-gallon polyethylene churn sample splitter. The resultant composite sample will then be thoroughly homogenized and poured off into properly prepared sample containers. Nutrient water samples that require preservation will be obtained in preserved ( $\text{H}_2\text{SO}_4$  pH <2) 500 mL sample containers. The polyethylene churn splitter will be thoroughly rinsed with ambient water at each location prior to sample collection. Bacteriological samples will be collected directly from mid-stream flow into properly prepared sterile sample bottles. Refer to Table 1 for a list of parameters, analytical methods, preservation, and holding times.

All sample containers will be equipped with sample labels that will be filled out using water proof markers with the following information: station location, sample identification, date of collection, and time of collection. Clear packing tape will be wrapped around each sample bottle and its label to insure that moisture from the coolers does not cause the loss of sample labels. All resultant samples will be placed in a cooler, on ice, to await shipment to the laboratory. Chain-of-Custody forms will accompany each sample shipment. All samples, with the exception of bacteria, will be shipped to the ASL in Moscow, Idaho for analyses. Bacteria samples will be sent to the State of Idaho Health and Welfare Laboratory in Couer d'Alene for analysis. Samples will be shipped either the same day or early the next morning to meet 30-hour holding time.

**Table 1. Water Quality Parameters**

Parameters	Sample Size	Preservation	Holding Time	Method
Non Filterable Residue (TSS)	1L	Cool 4°C	7 Days	EPA 160.2
Nitrogen( $\text{NO}_3+\text{NO}_2$ )	60 mL	Cool 4°C, $\text{H}_2\text{SO}_4$ pH < 2	28 Days	EPA 353.2
Total Phosphorus (TP)	100 mL	Cool 4°C, $\text{H}_2\text{SO}_4$ pH < 2	28 Days	EPA 365.4
<i>Escherichia coli</i> ( <i>E. coli</i> )	100 mL	Cool 4°C	30 Hours	MPN

### Field Measurements

At each location, field parameters of dissolved oxygen, specific conductance, pH, temperature and total dissolved solids will be measured. These measurements will be taken, when possible, from a well-mixed section, near mid-stream at approximately mid-depth. Calibration of all field equipment will be in accordance with the manufacturer's specifications. Refer to Table 2 for a listing of field measurements, equipment and calibration techniques.

**Table 2      Field Measurements**

Parameters	Instrument	Calibration
Dissolved Oxygen	YSI Model 55	Ambient air calibration
Temperature	YSI Model 55 StowAway temperature logger Model XTI 02	Centigrade thermometer Centigrade thermometer
Conductance & TDS	Orion Model 115	Specific Conductance (25°C)
pH	Orion Model 210A	Standard buffer (7,10) bracketing for linearity
Turbidity	Hach Model 2100P	Formazin Primary Standard

All field measurements will be recorded in a bound log book along with any pertinent observations about the site, including weather conditions, flow rates, personnel on site or any potential problems observed that may affect the quality of data.

## Flow Measurements

Flow measurements will be collected by wading and using a Marsh McBirney Flow Mate Model 2000 flow meter. The six-tenth-depth method (0.6 of the total depth below water surface) will be used when the depth of water is less than or equal to three feet. For depths greater than three feet the two-point method (0.2 and 0.8 of the total depth below the water surface) will be employed. At each gauging station, a transect line will be established across the width of the drain/creek at an angle perpendicular to the flow. The mid-section method for computing cross-sectional area along with the velocity-area method will be used for discharge determination. The discharge is computed by summation of the products of the partial areas (partial sections) of the flow cross-sections and the average velocities for each of those sections. This method will be used to calculate cubic feet per second at each of the monitoring stations.

Staff gauges will be used on selected segments to determine stream and river discharge during high water levels. Each staff gauge will be securely attached to a bridge or other permanent

secure structure so that not movement will occur. A stream cross-sectional profile at the staff gauge will be permanently established with metal stakes and shot in and recorded with laser level. Mannings n roughness coefficient will be estimated. Stream discharge will be taken as many events as deemed possible with rising water levels. This data as well as USGS continuous discharge data from St. Maries River near Santa will be used to develop a predictive model to use staff measurement to extrapolate stream discharge.

## **Quality Assurance and Quality Control (QA/QC)**

The ASL utilizes methods approved and validated by EPA. A method validation process, including precision and accuracy performance evaluations and method detection limit studies, are required of all of ASL Standard Methods. Method performance evaluations include quality control samples, analyzed with a batch to ensure sample data integrity. Internal laboratory spikes and duplicates are all part of ASL's quality assurance program. Laboratory QA/QC results generated from this project can be provided upon request.

QA/QC procedures from the field-sampling portion of this project will consist of duplicates (at 10% of the sample load) along with blank samples (one set per sampling day). The field blanks will consist of laboratory-grade deionized water, transported to the field and poured off into a prepared sample container. The blank sample is used to determine the integrity of the field teams handling of samples, the condition of the sample containers supplied by the laboratory and the accuracy of the laboratory methods. Duplicates consist of two sets of sample containers filled with the same composite water from the same sampling site. The duplicates are used to determine both field and laboratory precision. The duplicate and blank samples will not be identified as such and will enter the laboratories blindly for analyses. Both the duplicates and blank samples will be stored and handled with the normal sample load for shipment to the laboratory.

Bacteria water samples will be shipped from the Idaho Department of Health and Welfare building in Moscow to the laboratory in Couer d' Alene where the samples will be ran within the 30 hour holding time. Their procedures use MPN (most probable number) by Quantitray test to determine *E. coli* and total coliform concentrations. The laboratory in Couer d' Alene is certified by the State of Idaho to conduct laboratory analysis of bacteria.

## **Data Handling**

All of the field data and analytical data generated from each survey will be submitted to ISDA for review. Each batch of data from a survey will be reviewed to insure that all necessary observations, measurements, and analytical results have been properly recorded. The analytical results will be reviewed for completeness and quality control results. Any suspected errors will be investigated and resolved, if possible. The data will then be stored electronically and made available to any interested entity.

## **Data use**

The data generated from this monitoring program will be used by IASCD, SCC, and the BSWCD to determine loads within the stream, identify areas where BMP's would have the greatest benefit, provide baseline data prior to TMDL development, and identify changes as BMP's are implemented. Data will also be available to other agencies and the general public.

#### References

Osburn, S. 2002. Personal communication. Emerald Creek Garnet. Fernwood, Id.